

XXIV.—On a New Species of Agelacrinites, and on the Structural Relations of that Genus. By E. J. CHAPMAN, Professor of Mineralogy and Geology in University College, Toronto.

Introductory Notice.—The accompanying figure represents, on a somewhat enlarged scale, the upper side of an undescribed species of Vanuxem's rare and interesting genus *Agelacrinites*, discovered amongst some Lower Silurian fossils from the Trenton Limestone of Peterborough, Canada West. It is dedicated to the able palæontologist of the Geological Survey of Canada, whose researches have so greatly added to our knowledge of the obscurer organisms of the Silurian age, and who has done so much, in all respects, for the advancement of Canadian palæontology.



Agelacrinites Billingsii.

The present communication is subdivided into two short sections. The first contains a detailed description of the new species. This description, however, it should be remarked, is founded on a single example. The second section comprises an analytical review of the genus *Agelacrinites* in general, more especially with regard to its structural relations and affinities.

1. *Description of Agelacrinites Billingsii.*—Body circular, or nearly so. In the specimen on which this description is based, its diameter is exactly half an inch. It is slightly convex above, and flat, or apparently somewhat concave below. From the centre of the upper side, five rays, composed each of a double series of alternating or interlocking plates, radiate towards the margin of the disk, and terminate in well-defined points at about the twelfth of an inch from this margin. The rays, in the specimen under examination, exhibit no traces of pores, even when strongly magnified. Nevertheless pores may have been, and probably were, originally present. It is easy to conceive how minute orifices of this kind might become obliterated during fossilization; whilst, on the other hand, the object of the rays is altogether inexplicable, unless we look upon them as really representing ambulacral areas. Moreover, poriferous ray-plates have actually been discovered in certain examples of *Agelacrinites*; and analogy, consequently, would lead us to infer that they existed originally in all. These rays, at their origin, leave a small central space covered by larger and somewhat rhombic plates. The latter appear to be five in number, and to constitute the first ray-plates, one being common to two adjacent rays. Very possibly, however, each of these rhombic plates may be divided through the centre, longitudinally; for the specimen is much broken at this spot, and the plates are pressed, more or less, one over the other. The

interradial spaces and the margin of the disk are covered by numerous irregularly disposed, scale-like and partially imbricating plates. At the margin these are very small, exceedingly numerous, and arranged in three or four irregular rows, with their longest diameter pointing towards the centre of the disk. To these succeed a series of larger plates, having their greatest diameter in a direction at right angles to that of the border plates, or, in other words, parallel with the circumference of the disk. To these succeed, again, other and somewhat smaller plates, all partially overlapping. This arrangement of the surface plates seems to be an extreme modification of that which obtains in *A. Hamiltonensis* of Vanuxem, and *A. Bohemicus* of F. Roemer; but the larger plates merge gradually, as it were, into the others, and thus there is no defined circle of large plates separating (as in the latter types) the border plates from those of the centre. Finally, in one of the interradial spaces, at a distance of about one-sixth of an inch from the centre of the disk, a well-marked "pyramidal orifice" is situated. This, in the specimen under examination, is about one-twentyfourth of an inch in diameter, and is made up, apparently, of ten plates, in two sets of five—one set alternating within the other, as in Hall's *Hemicystites parasitica*. The under side of our species remains unknown; but, in the specimen examined, it is not attached to a shell or other organic body, and hence, as shown moreover by examples of other species, the genus cannot properly be considered a parasitic one.

Agelacrinites Billingsii differs essentially from the Canadian *A. Dicksoni* of Billings (and also from the *Edrioaster Bigsbyi* of that palæontologist) by the possession of *short* and *straight* rays, and by its numerous marginal plates. It is also at once distinguished by its straight rays, independently of other characters, from the typical Devonian species, *A. Hamiltonensis* of Vanuxem, and the more recently discovered Carboniferous species, *A. Kaskaskiensis* of Hall. It agrees, on the other hand, somewhat closely with Hall's *Hemicystites parasitica* = *Agelacrinites parasiticus* from the Niagara Limestone of New York; but in this latter species the rays are very narrow at their origin, and are connected there (in the centre of the disk) by a small tubercle or rounded plate. In place of becoming narrower also towards the margin (as in *A. Billingsii*) and terminating in well-defined points, they become rapidly broader, "coalesce with the plates of the body" (Professor Hall), and are altogether undefined at their extremities. These characters, as given in the 'Palæontology of New York' (vol. ii. p. 245, and plate 51. figs. 18-20), from an examination of several specimens, are exactly the reverse of those which obtain in our new species. Whilst, also (although

this character is probably somewhat indefinite), the small border plates in *A. Billingsii* form two or three circles, in *A. parasiticus* they appear to occur only in a single row.

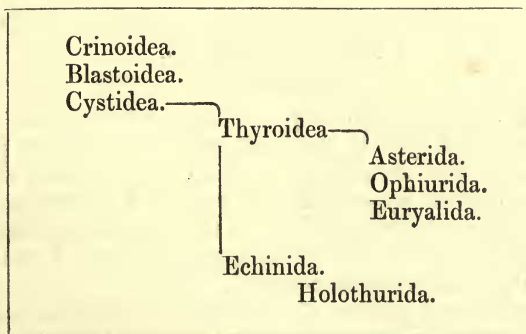
2. *Analytical Review of the Genus Agelacrinites and its included Species.*—The generic characters of *Agelacrinites* may be thus defined:—Form circular; stemless; flat or concave below, and somewhat convex above; and covered by numerous small plates, arranged in part irregularly, and in part in regular order. The definitely arranged plates form five rays (ambulacral areas?), which originate at the centre of the upper side of the body. These rays are either short and straight or long and curved. They are also composed of a double series of small polygonal plates, interlocking along the central line of ray; or, otherwise, of a single (?) series of plates (Roemer's *A. Rhenanus*). The irregularly arranged plates are elliptical or circular, variable in size, very numerous, thin, scale-like, and imbricating; or imbricating at and around the margin of the disciform body, and joining by their edges in the more central part of the disk. The marginal plates are commonly very small, and, in some species, are separated from the more central plates by a circle of comparatively large pieces. In the centre of one of these (interambulacral?) spaces, and about midway between the apex of the body and the margin, is situated an orifice covered by a pyramid of five or more (moveable?) plates. The apex itself, or centre and origin of the rays, is covered by a single circular plate, or is surrounded by five or ten angular plates—these latter constituting the first plates of the rays. Characters of the under side of the body, position of mouth, &c., not definitely known.

From this definition, it is clear, as, indeed, is universally allowed, that *Agelacrinites* belongs to the Echinodermata. In the present state of our knowledge, however, it is impossible to refer it satisfactorily to any one of the admitted orders or families of that class. With the Crinoids proper, and the Blastoids, it appears to have only general affinities; but with the Cystideans it is evidently closely connected: more especially by the possession in common of a pyramidal orifice or so-called anal pyramid. It differs from the Cystidean structure, nevertheless, in many important respects: the peculiar rays, the imbricating plates, the absence of a stem, for example, are essential points of difference. The imbrication of the plates serves to connect it, through the genus *Protaster*, with the Euryales or the Ophiurians; and the conformation of the rays, in certain species, appears to afford another link in support of this view. But is it not equally related to the Echinida? After a careful consideration of the subject, I cannot refrain from hazarding an opinion that the

position of the mouth, as usually given, is erroneous. In several species, as in *A. parasiticus* and *A. Kaskaskiensis* of Hall ('Geology of Iowa,' vol. i. part 2. pl. 25), the centre or origin of the rays is a simple disk or rounded tubercle—incontestably, no mouth: and hence we may fairly assume that, in other species also, the mouth must be situated elsewhere. The question then arises as to the real nature of the pyramidal orifice. This is usually looked upon either as an anal orifice or as an ovarian aperture. Neither of these views is by any means certain, nor, indeed, apparently susceptible of proof. To consider this orifice as the mouth, however, appears a still less satisfactory conclusion. In the Crinoids proper, the true position of the mouth is still, strictly speaking, unknown. It is considered in some genera to be in the centre of the "vault," or upper surface, and in others to occupy an excentric position, as between two of the arms, &c. This latter view is unsustained by any proof, beyond the mere occurrence of an orifice at the points in question. The excentric orifice may or may not be the mouth. But if we omit these forms from consideration, and turn to those types of Radiata in which the position of the mouth is no longer doubtful, that organ, it will be seen, is invariably situated in the centre of the body, except in the Family of the *Spatangidæ*, the highest family or natural group of the entire series. In the other families of the Echinida, in the Asterida, Ophiurida, and other orders in which the position of the mouth is truly known, the mouth is always central. This is evidently its normal position in the radiated type of structure, and one, consequently, that we should scarcely expect to see departed from, except in the case of those forms which stand at the higher limit of the series. Unless this view be adopted, we must almost necessarily assume that in the Radiata there are certain natural groups (not yet thoroughly worked out) which are perfectly unconnected with each other, and in which, respectively, the higher forms foreshadow an advanced type of structure, whilst the lower forms present the normal type. The higher forms of a low group, however lowly organized as to their entire structure, will be thus, in certain respects, in advance of the lower forms of a higher group. Whatever grounds there may be to believe that some law of this kind really holds good in Nature, its application in the present place would be evidently forced. Discarding, therefore, the idea that in the pyramidal orifice of the Cystideans and *Agelacrinites* the mouth is represented, this latter organ must be sought for in another place. Reasons have already been stated against this being the centre of the rays. Its true position will be found, I believe, in the centre of the under side of the body. But, it may be urged in objection to this, the genus *Agelacrinites* is

sessile—is attached by its under surface to shells and other foreign bodies; and hence the mouth cannot be situated there. Several examples, it is quite true, have been met with attached in this manner to Brachiopod shells; but this is by no means a general condition of occurrence, and, rightly considered, is no proof of an original *permanent* attachment. It is just as exceptional a mode of occurrence, indeed, as that from which Vanuxem derived the name of the genus.

This suggestion as to the true position of the mouth cannot, of course, be satisfactorily adopted until confirmed by the examination of more perfect specimens than those hitherto discovered, or until the proper functions of the pyramidal orifice, in this genus and in the Cystideans, are clearly ascertained. But, under any view, it seems obvious that, without a forced collocation, these peculiar forms cannot be placed in any existing group. In the present restricted state of our knowledge at least, they must form a group apart. Mr. Billings (Decade III. of 'Canadian Organic Remains,' under description of *Agelacrinites Dicksoni*) appears inclined to regard them as constituting a sub-order of Star-fishes; and he proposes to arrange them in this connexion under the term of *Edrioasteridæ*. This name seems objectionable, however, on two grounds: first, because the supposed sessile (*i. e.* parasitic) condition of *Agelacrinites* is by no means proved; and secondly, because the relations of the genus to the Star-fishes—in so close a way, at least, as the name would imply—is not yet established. For these reasons I would suggest the term *Thyroidea*, in allusion to the valved aperture, as the name of the special group or order framed for the reception of these forms. The following scheme will then represent the probable relations of the various leading groups belonging to the Echinodermata generally:—



In the group *Thyroidea* we have, at present, but one family—that of the *Agelacrinitidæ*, comprising, probably, but one known

genus: *Agelacrinites*. The recognized species of this genus are enumerated in the annexed tabular view:—

Subkingdom **RADIATA**.

Class **ECHINODERMATA**. Order **THYROIDEA**.

Fam. **Agelacrinitidæ**.

Genus **AGELACRINITES**.

Synopsis of Species.

A.—LOWER SILURIAN SPECIES.

(Rays curved):—

1. *A. Buchianus*, E. Forbes.
2. *A. Cincinnatiensis*, Roemer.
3. *A. Dicksoni*, Billings.
4. *A. (Edrioaster) Bigsbyi*, Billings.

(Rays straight):—

5. *A. Bohemicus*, Roemer.
6. *A. Billingsii*, Chapman.

B.—UPPER SILURIAN SPECIES.

(Rays straight):—

7. *A. parasiticus*, Hall.

C.—DEVONIAN SPECIES.

(Rays curved):—

8. *A. Hamiltonensis*, Vanuxem.
9. *A. Rhenanus*, Roemer.

D.—CARBONIFEROUS SPECIES.

(Rays curved):—

10. *A. Kaskaskiensis*, Hall.

XXV.—On the Genera *Peltogaster* and *Liriope* of Rathke.

By **W. LILLJEBORG**.

[With a Plate.]

PROFESSOR LILLJEBORG of Upsal has published, in the 'Transactions of the Royal Academy of Sciences' of that place, a memoir containing detailed descriptions of the animals to which the above generic appellations were given by Rathke. As it forms an interesting supplement to the memoirs by Steenstrup and Leuckart which have already appeared in this Journal*, we here give an abstract of its contents.

In the historical portion of his memoir, the author goes over the same ground as his predecessors; so that there is no occa-

* See Ann. Nat. Hist. 2nd ser. vol. xvi. p. 153, and 3rd ser. vol. iv. p. 422.